Performance Track Leading Practices

Andersen Closes the Loop on its Energy Supply with Renewable On-site Generation and Warm Water Recovery

Costs and Benefits of Andersen's Steam and Warm Water Recovery Systems

Costs	Savings and Other Benefits
$22 million for the project–large capital expenditure with multi-year payback period. (grant and rebates can offset some of the costs of renewable energy investments).	Reduces energy loss from piping steam from an external supplier.
Working with regional and community stakeholders to ensure support.	Control over the efficiency and reliability of facility steam supply.
	Closes the loop on Andersen's wood waste stream–reduced waste disposal cost.
	WWRS uses free source of waste heat from a nearby power plant.
	WWRS reduces the thermal load of waste water flowing into the St. Croix River.

National Environmental PerformanceTrack
U.S. Environmental Protection Agency

EPA United States Environmental Protection Agency

PERFORMANCE TRACK FACILITY

Andersen Corporation, Bayport, Minnesota

GOAL CATEGORY

Alternate Goal: Increase renewable energy use from biomass and recovered warm water

RELATED INDICATORS

Inputs: Total Energy Used from Renewable Sources

OVERVIEW

Andersen Corporation's window and door manufacturing facility sits on a 65-acre site along the St. Croix River in Bayport, Minnesota. In 2007, the plant began operation of its new on-site steam generating facility (SGF), which supplies steam for the production of up to six million windows and doors per year.[1] Built on the footprint of an older, vacant Andersen building, the new SGF was designed to efficiently burn renewable wood fuel and eliminate the facility's reliance on coal-based steam sourced from a neighboring power plant.

In 2005 when the SGF project began, more than 60 percent of Andersen's steam was being piped in from a neighboring power plant, with the remainder generated in-house by the existing wood-fed boiler system. When the local supplier began phasing out its steam generating capacity, Andersen decided to assume greater control of its energy supply by designing and installing its own steam generating facility at its Bayport site.

Based on environmental, cost, and performance measures, Andersen calculated that a new on-site, biomass steam sourcing solution would meet its energy needs while having the least impact on the surrounding community and environment. The boilers are fed with wood byproduct—shavings, chips, or fines—from Andersen's own wood milling operations. All of the material is processed through a grinder to produce a fine powder, called wood flour, which is fed directly into the on-site renewable boilers. The company set Environmental Management System (EMS) goals to increase the quantity of renewable wood flour used to fuel the boilers for steam production, and to increase the use of recovered condenser water from the neighboring power plant to heat portions of the facility during the winter months. Andersen also decommissioned its six older wood-fired boilers as a result of this project.

The new SGF installation includes a warm water recovery system (WWRS), which uses existing pipes from the old steam infrastructure to transport warm discharge water into the facility heating system. As part of Andersen's commitment to voluntary environmental improvement, its goal under the Performance Track program was to increase the use of renewable biomass fuel and warm-water energy. Progress toward

[1] 2008 figure

increasing energy use from renewable sources is measured in MMBtu.[2] Currently, Andersen's SGF enables the facility to produce more than 60 percent of its required steam and heat from renewable energy and the warm water recovery loop. Andersen intends to continuously improve this percentage.

ANDERSEN'S ON-SITE STEAM GENERATING FACILITY AND WARM WATER RECOVERY SYSTEM

The Andersen team worked closely with its design, engineering, and construction contractors to ensure that the design and implementation of the SGF followed the project's four guiding principles:

- ★ Partnership
- ★ Innovative Design
- ★ Environmental Responsibility
- ★ Community Sensitivity

The design/build package consisted of a $22 million steam-generating facility to be entirely owned by Andersen and featuring all-new, state-of-the-art equipment. By owning and operating the SGF on-site, Andersen directly manages the day-to-day operation and efficiency of its boilers and maintains control over the quality and supply of the steam produced. This also prevents energy loss when steam is transported from an off-site supplier.

To minimize environmental and visual impacts, the SGF was built on the footprint of an existing storage building adjacent to the manufacturing buildings. Steel for the SGF structure was salvaged from used railway lines from the older demolished building. To manage runoff and reduce sedimentation, an industrial rain garden was added that reduces the amount of stormwater entering the adjacent St. Croix River scenic waterway. In addition, the structure itself was designed to minimize noise and visual impact; all noise-generating devices were located inside the building and a casing pipe surrounds the two boiler stacks so that only a single stack is visible from the outside of the SGF.

The new boilers in the SGF have been designed to burn wood byproduct from Andersen's manufacturing operations. Wood was chosen as the primary boiler fuel because it is a renewable resource and an ample supply is generated from Andersen's operations. Different waste wood streams result in differently sized wood particles such as shavings, chips, or fines. All of the material is processed through a grinder to produce a fine powder. The wood flour is then conveyed from a storage silo, weighed on a belt scale, and delivered to a small live bottom bin that feeds burners firing two boilers, each capable of producing 40,000 pounds of steam per hour.

The wood fuel preparation process assures efficient combustion and minimal ash generation. The ash byproduct from the boilers is sold to area farmers to amend deficient soil, so Andersen is able to divert the majority of its SGF waste stream from the local landfill and create an additional revenue stream for the company.

Andersen's on-site Steam Generating Facility uses renewable sources by combining wood-fired boilers with the heat recovery resulting from a Warm Water Recovery System.

While the neighboring power plant no longer supplies steam to Andersen, its thermal facility continued to release warm water—up to 65 degrees Fahrenheit—from its turbines into the St. Croix River. Part of the engineering contractor's design for Andersen's new energy infrastructure included a customized warm water recovery system (WWRS) that uses this warm water to run through four large makeup air-handling units each capable of ingesting 750 gallons of temperate water per minute for a total of 3,000 gallons per minute. This warm water recovery loop uses the old steam lines and new pumps to move water into the facility heating and air circulation system, so less energy is required to heat the plant.

IMPLEMENTATION OF ANDERSEN'S SGF AND WWRS

Andersen worked closely with its community advisory boards and welcomed feedback on the design and construction of its SGF. The Andersen Community Advisory Committee (CAC) has been a stakeholder in Andersen's environmental performance for more than 10 years, and input from the CAC influenced many of the low-impact features of the SGF—including the rain garden, the one-stack exterior structure, and the noise buffers.

TKDA, an engineering, architecture, and planning firm, was involved throughout the entire SGF project from design to implementation and construction. The project was led by a team composed of staff from Andersen and TKDA. The design/build team managed the construction phase of the project and included energy, construction, and electrical contractors. The team worked closely with Andersen to develop a customized system to process and transport wood waste to the new SGF. The wood-fired boilers are also equipped with low-nitrogen-oxide natural gas burners as a backup heat source to the wood burners. Flue gas is used to preheat make-up water to further conserve energy. Andersen facility staff manage the maintenance and operation of the SGF, which provides the facility with full control over the system.

[2] MMBtu = 1 million Btu. The British thermal unit is a traditional unit of energy used in the power, steam generation, heating, and air conditioning industries.

BENEFITS OF ANDERSEN'S SGF AND WWRS

When Andersen committed to using recovered warm water and renewable biomass fuel to meet its energy needs, it dramatically reduced its reliance on steam purchased from coal-based, non-renewable energy sources. By recovering warm water, the Bayport facility currently offsets about one-eighth of the total energy needed to produce all of its steam requirements. Andersen plans to continually increase this amount. Heating with recovered warm water has the added benefit of reducing the thermal load to the St. Croix River from the nearby power plant.

Because Andersen's boilers are extremely efficient at burning wood flour to produce steam energy, they produce little ash. This significantly reduces the facility's ash handling costs. The Bayport plant's energy costs are now significantly lower and the facility is in a position to meet its energy needs without depending on external sources. The award-winning Andersen SGF has been a clear success, helping the Bayport plant to improve its environmental performance while meeting its energy needs in a sustainable, community-sensitive manner.[3]

RESOURCES FOR MORE INFORMATION

- ★ EPA's Clean Energy site [http://www.epa.gov/cleanenergy/index.html] provides a gateway to resources on renewable energy technology and efficiency best practices.
- ★ Andersen's Sustainability page [http://www.andersenwindows.com/servlet/Satellite/AW/Page/awGeneral-3/1200437179427] communicates the company's environmental initiatives and includes information on the Bayport plant's renewable energy steam facility.

---

[3] TKDA's work on the Andersen SGF project was recognized by the American Council of Engineering Companies as a 2009 Engineering Excellence Award Winner, which recognizes excellence in engineering and new technologies that enhance business and protect the environment.